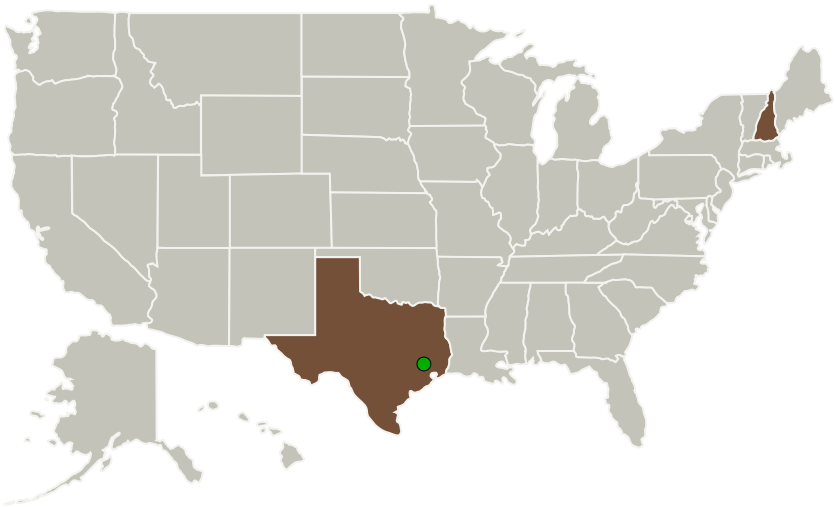
Renewable Long-Life Biocidal Hydrophilic Coating for Condensing Heat Exchangers, Phase I

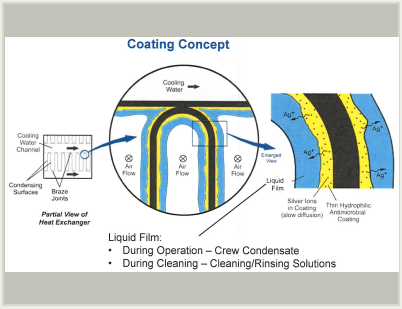
Completed Technology Project (2013 - 2013)

Project Introduction

Future manned spacecraft and lunar or Mars outposts will need a condensing heat exchanger (CHX) to control humidity in the cabin atmosphere. Condensing surfaces must be hydrophilic to control the condensate flow and ensure efficient operation, and biocidal to prevent growth of microbes and formation of biofilms on condensing surfaces. Coatings must be extremely stable, adhere to the condensing surface, and maintain hydrophilic and biocidal properties for many years. We propose to develop a zeolite coating system that incorporates two key innovations: (1) modifications to the coating chemistry to enable much longer life than prior coatings, and (2) an in situ cleaning process that can decontaminate the surface and renew hydrophilic properties. In Phase I we will prove the feasibility of our approach by developing preliminary cleaning formulations, developing chemical analysis models to predict coating lifetime, producing trial coatings, and demonstrating coating performance and the effects of cleaning. In Phase II we will scale up and refine the coating process, produce sample coupons and heat exchanger cores, and measure the coating performance after long-term exposure to prototypical environments. We will also develop and demonstrate a coating regeneration process and associated hardware suitable for ground testing and eventual demonstration on the International Space Station (ISS).

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Creare LLC	Lead Organization	Industry	Hanover, New Hampshire
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
New Hampshire	Texas

Project Transitions

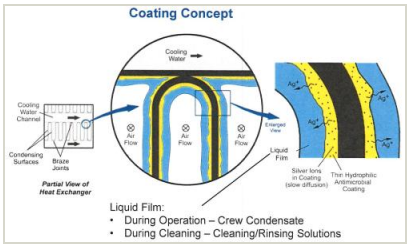
May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138462)*

Images



Project Image
Renewable Long-Life Biocidal Hydrophilic Coating for Condensing Heat Exchangers *(https://techport.nasa.gov/image/136501)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Creare LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Michael G Izenson

Co-Investigator:
Michael Izenson

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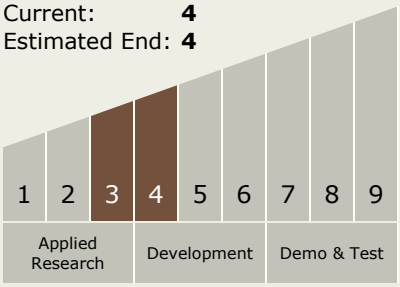
Completed Technology Project (2013 - 2013)

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.1 Heat Acquisition

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System